

Portable surface treating apparatus

This invention relates to a portable surface treating apparatus comprising a shaft
5 part with a handle part by means of which the apparatus can be guided on the surface to
be cleaned and a frame structure having several rolls about which an endless conveyor
belt for liquid and dirt particles is arranged.

Apparatus of the type mentioned above are previously known, see US 4926515,
and are used for wet cleaning of for instance floor surfaces. These apparatus also
10 comprise a container for dispensing cleaning liquid to the surface and a container for
collecting dirty liquid which is picked up from the surface. The belt consists of a liquid
absorbing material conveying the dirty liquid from the surface to the lastmentioned
container in which the liquid is removed from the conveyor belt by a squeezing means.
This type of apparatus has however the drawback that the belt abuts the surface by line
15 contact which means that the absorption capacity becomes less good since the belt is
squeezed by means of the compression forces when resting against the surface.
Moreover, the apparatus is be hard to handle and guide depending on that the driving
motion of the belt is accomplished by means of manual measurements from the operator
i.e. by friction engagement between the belt and the surface.

It is also previously known , see US 4875246, to use similar surface treatment
20 apparatus driven by electric motors and comprising a roll having an exterior surface of
liquid absorbing material the roll being driven by the electric motor and conveying the
dirty liquid from the surface to a collecting container. Also this apparatus has the
drawbacks that are linked to line contact with the surface and the result is that too much
25 water remains on the surface which means long drying periods after the treatment.

Further there are floor scrubbing machines having endless belts that operate with
area contact, see for instance DE 10025446 A1, US 3945078, WO 02/39869 A1. Since
these devices solely are provided with means for squeezing out the liquid from the belt
there is a considerable risk that dirt particles which are conveyed by the belt are not
30 removed from the belt together with the liquid but instead is re-deposited on the floor
surface.

The purpose of this invention is to achieve a portable surface treating apparatus
that conveys liquid as well as dirt particles from the surface to the collecting container
and that does not have the drawbacks mentioned above. The apparatus is simple to

handle and easy to guide at the same time as it safeguards a high degree of liquid removal from the surface such that it gets dry quickly. This is achieved by means of a device having the characteristics mentioned in the claims.

An embodiment of the invention will now be described with reference to the accompanying drawings on which Fig. 1 is a perspective view of the surface treatment apparatus in question whereas Fig. 2 is a perspective view of the lower portion of the apparatus without the conveyor belt that normally is arranged on it, Fig. 3 is a vertical section through a part of said lower portion, Fig. 4 is a plan view of a container part which is removably arranged at the rear part of the lower portion whereas Fig. 5 and 6 are the same views as Fig. 4 in which the parts are partly demounted.

As appears from Fig. 1 the surface treatment apparatus comprises an upper part 10 and a lower part 11. The upper part comprises a shaft 12 with a handle 13. The lower end of the shaft continues via a link connection 14 into a bracket 15 in which the lower part 11 is removably secured in a manner not shown in detail. The shaft 12 supports two removably arranged containers, a first container 16 for a cleaning liquid and a second container for dirty liquid 17. The upper part 10 also is provided with a control panel 18 arranged close to the handle and by means of which the different functions of the apparatus can be controlled the control panel being connected to an electric circuit, not shown, that is fed from mains supply via a cable 19. This current source may of course if desired be replaced by a battery source.

The first container has a fill opening and one outlet, not shown, which is placed at the bottom and to which a valve is connected. The valve can be opened from the control panel 18 in order to let out the cleaning liquid through a hose 20 that is connected to a nozzle, not shown, at the bottom side of the bracket 15. The other container 17 for dirty liquid is by means of a hose 21 connected to the lower part 11 in a way that will be described below.

The lower part 11 comprises an elongated, slightly V-shaped, box shaped frame structure 22 comprising a front and a rear part 22a and 22b resp. that are turnably connected to one another about an axis 23. The frame structure 22 comprises two side walls 24 and an upper and a lower wall 25 and 26 resp. that constitute flat elongated surfaces against which the inner side of an endless conveyor belt 27 rests. The conveyor belt comprises a supporting layer 27a on which a soft liquid absorbing layer for instance a so called micro fibre layer 27b is arranged. The supporting layer has a central ridge 27c directed inwardly and whose purpose will be explained below.

The front and rear part 22a and 22b resp of the frame structure can, as has been described above, be turned with respect to one another between a first position where the parts are aligned with respect to one another and where the front part 22a is prevented from turning upwards with respect to the rear part 22b by means of co-
5 operating abutting surfaces 28 to a second position where the front part 22a is folded down with respect to the rear part 22b such that the conveyor belt can be removed from the frame structure.

The frame structure 22 also supports a front roll 29 which is freely rotatable about a shaft 30 and a rear roll 31 rotatably arranged about a shaft 32. The frame
10 structure 22 as well as the rolls 29,31 are provided with central grooves 33, 34, 35 in which the ridge 27c of the belt runs. The frame structure 22 also encloses an electric motor 36 having a drive shaft 37 that via a belt transmission 38 transmits the rotation motion of the drive shaft to the rear roll 31. The frame structure 22 at its rear end also supports a container part 39 which is removably arranged at the frame structure 22 by
15 means of two snap tongues 40 arranged one at each side of the frame structure.

The container part 39 constitutes a container with a bottom 39a, side walls 39b, a front wall 39c and a rear wall 39d. The front wall 39c is shaped as a part of the exterior surface of a horizontal cylinder and is placed such that the distance between the outside of the wall 39c and the part of the conveyor belt 27 that rests against the roll 31
20 is successively decreased when the conveyor belt moves upwards in Fig. 3 together with the roll. The front wall is tapered such that the liquid following the belt will flow downwards, inwards towards the container. The bottom 39a of the container supports a removable scratching plate 41 which in section is L-shaped and which has a first leg 41a whose lower end is inserted between two dowels 42 such that the scratching plate can
25 be turned about this end. The other leg 41b of the scratching plate has several openings 41c and the scratching plate 41 is additionally shaped such that the liquid which is present in the container can freely flow about or through it. The free end of the other leg 41b of the scratching plate is by means of spring pressure arranged to abut the conveyor belt 27 above the front container wall 39c the spring force being achieved by means of
30 an L-shaped spring plate 43 that is connected to the first leg 41a and having an extending leg portion 43a arranged to rest on the bottom of the container 39a.

The container part 39 encloses a removable pump housing 44 that is provided with a membrane pump 45 having an inlet 46 facing the bottom and an outlet, not shown, that via a check valve 47 is connected to a nipple on which the hose 21 is

applied. The front part of the pump housing 44 has a flange 48 that is directed downwards and that rests on the leg 43a of the spring plate 43 and normally pushes it against the bottom of the container 39a. The pump housing also has a sleeve 49 that is arranged centrally and that co-operates with a bead 50 arranged at the bottom of the container in order to place the pump housing into the right position in the container part 39. Between the bottom side of the pump housing 44 and the bottom 39a of the container (and outside the inlet 46 of the pump and the bead 50) a porous filter mesh 51 is inserted.

The container is partly covered by a rocker arm with 52 having two dowels 53 that are supported for turning motion at the side walls 39b of the container. The front part of the rocker arm 52 supports a freely rotating roll 54 that abuts the conveyor belt 27 at its entire width and the motion of the conveyor belt due to friction engagement creates a rotating motion of the roll. The roll is eccentrically supported by the rocker arm 52 by means of a dowel 55 arranged at each side of the roll. The rear part of the rocker arm 52 rests against a push rod 56 that is surrounded by a coil spring 57 the push rod serving as an active means for the membrane pump 45. Thus, the tilting motion of the rocker arm 52 created by the roll 54 means a to-and-fro motion of the push rod 56 whereby the membrane pump 45 is activated.

The container part 39 also has a channel 58 that is placed at each side of the rear roll 31 the channels extending forwards, upwards from the container at each side wall 39b such that liquid flowing from the belt drops down into the channel and is transported to the container.

The device operates and is used in the following manner. The operator removes the first container 16 from the apparatus and the hose 20 and fills it with a suitable cleaning agent after which the container is again replaced on the apparatus. Then the operator starts the motor 36 by means of the control panel 18 and simultaneously applies cleaning liquid on the belt by means of the valve that is built into the container and via the hose 20 and the nozzles arranged below the bracket 15. The drive shaft 37 of the electric motor thereby transfers the drive force via the gear 38 to the rear roll 31 that drives the conveyor belt 27 counter-clockwise in Fig. 2 about the front roller 29 the conveyor belt being centered because its elongated ridge 27c runs in the grooves 33, 34 and 35. Hence, cleaning liquid will be applied on the surface by means of the conveyor belt 27 at the same time as dirt particles together with the liquid is transported up through the gradually narrowing gap between the conveyor belt and the front wall 39c.

When the conveyor belt reaches up above the front wall 39c dirt particles and a part of the liquid will be removed from the belt by means of the portion of the leg 41b of the spring loaded scratching plate 41 that abuts the conveyor belt. When the belt continues to move upwards about the roll 31 the belt will get in touch with the roll 54 that then
5 squeezes out the liquid which is contained in the belt. The major part of the liquid that is squeezed out flows down through the openings 41c in the scratching plate 41 and brings the dirt particles to the container whereas liquid also is collected from the edges of the belt and flows down into the container via the channels 58. Simultaneously the membrane pump 45 will operate since the roll 54, that is supported eccentrically and
10 that is in friction engagement with the belt, rotates and thereby achieves a tilting motion of the rocker arm 52 that acts on the pump via the push rod 56. Thus, the liquid which is collected in the container flows through the filter 51 to the pump inlet 46 from which it flows further through the pump 45 and the check valve 47 through the hose 21 up to the dirty liquid container 17. When the cleaning has been finished the dirty liquid container
15 17 is removed and emptied of its content. If desired the conveyor belt 27 can be removed by folding down the front part 22a of the frame structure 22 with respect to the rear part 22b. After cleaning or replacing the belt the frame structure can be moved back to its normal position by again folding up the front part 22a such that the abutting surfaces 28 will touch each other.

20 It should in this connection be mentioned that the device is designed such that the components that are involved easily can be demounted and be cleaned. Thus, the container part 39 can easily be removed from the frame structure 22 by acting on the snap tongues 40. When a locking means, not shown, has been released the rocker arm 52, the pump housing 44 with the check valve 47, the filter mesh 51 and the scratching
25 plate 51 with the spring plate 43 can successively be lifted out from the container.

The apparatus according to the invention is very easy to handle since the electric motor pulls the apparatus in the forward direction which means that the operator easily can guide the apparatus in the desired direction by means of minimal manual efforts.